

WHAT IS CLAIMED IS:

1. A wobble information detection method for an optical recording medium having synchronizing information recorded at predetermined intervals along a track of said optical recording medium, said track being formed with a wobble which is phase modulated to record information in a plurality of sections including at least one reference wobble section which expresses a predetermined one of two different binary values and a plurality of successive unit data sections constituting a data wobble sequence, each of said unit data sections expressing one of said binary values, wherein said method comprises steps of:
 - performing playback of said optical recording medium to obtain a wobble signal from said wobble of said track;
 - operating on said wobble signal to generate a synchronizing signal that is synchronized with said wobble signal;
 - sampling said wobble signal, using said synchronizing signal, to perform synchronous detection and thereby obtain successive sample values of said wobble signal;
 - detecting said synchronizing information, based on said sample values;

defining a series of phase integration intervals,
occurring at respective timings determined based on said
synchronizing information;

initializing a phase integration value to zero
5 immediately prior to a phase integration interval within
said reference wobble section in said wobble signal and
successively incrementing said phase integration value by
sample values which are obtained during said phase
integration interval, to obtain a reference phase
10 integration value;

storing said reference phase integration value;

initializing said phase integration value to zero
immediately prior to each of respective phase integration
intervals within said unit data sections of said data
15 wobble sequence and successively incrementing said phase
integration value by sample values which are derived
during said each phase integration interval, to thereby
obtain a phase integration value corresponding to said
each unit data section;

20 for each said unit data section, comparing a
polarity of said corresponding phase integration value
with a polarity of said reference phase integration
value; and

judging a binary value expressed by said each unit
25 data section, based upon results of said comparison.

2. A wobble information detection apparatus for detecting wobble information on an optical recording medium having synchronizing information recorded at
5 predetermined intervals along a track of said optical recording medium, said track being formed with a wobble which is phase modulated to record information in a plurality of sections including at least one reference wobble section which expresses a predetermined one of two
10 different binary values and a plurality of successive unit data sections constituting a data wobble sequence, each of said unit data sections expressing one of said binary values, said apparatus including optical pick-up means for producing a wobble signal corresponding to said
15 wobble during playback of said optical recording medium;

wherein said apparatus comprises:

synchronizing signal generating means for operating on said wobble signal to generate a synchronizing signal that is synchronized with said wobble signal;

20 synchronous detection means for performing synchronous detection of said wobble signal to thereby obtain successive sample values of said wobble signal, phase integration interval setting means for detecting said synchronizing information, based on said sample
25 values, and for defining a series of phase integration

intervals occurring at respective timings that are determined based on said synchronizing information;

means for initializing a phase integration value to zero immediately prior to each of said phase integration
5 intervals;

memory means for storing a reference phase integration value;

phase integration means functioning during a phase integration interval within said reference wobble section
10 in said wobble signal to successively increment said phase integration value by sample values which are derived during said phase integration interval, to thereby obtain said reference phase integration value and supply said reference phase integration value to said
15 memory means to be stored therein, and functioning during each of respective phase integration intervals within said unit data sections of said data wobble sequence to successively increment said phase integration value by sample values which are derived during said phase
20 integration interval, for thereby obtaining a phase integration value corresponding to said each unit data section;

comparator means for comparing respective polarities of said corresponding phase integration values with a
25 polarity of said reference phase integration value; and

judgement means for judging respective binary values expressed by said unit data sections, based upon results of said polarity comparisons.

5 3. A wobble information detection method for an optical
recording medium having synchronizing information
recorded at predetermined intervals along a track of said
optical recording medium, said track being formed with a
wobble which is phase modulated to record information in
10 a plurality of sections including at least one reference
wobble section which expresses a predetermined one of two
different binary values and a plurality of successive
unit data sections constituting a data wobble sequence,
each of said unit data sections expressing one of said
15 binary values, wherein said method comprises steps of:

performing playback of said optical recording medium
to obtain a wobble signal from said wobble of said track;

operating on said wobble signal to generate a
synchronizing signal that is synchronized with said
20 wobble signal;

sampling said wobble signal, using said
synchronizing signal, to perform synchronous detection
and thereby obtain successive sample values of said
wobble signal;

detecting said synchronizing information, based on
said sample values;

defining a series of phase integration intervals,
occurring at respective timings determined based on said
5 synchronizing information;

initializing a phase integration value to zero
immediately prior to a phase integration interval within
said reference wobble section in said wobble signal and
successively incrementing said phase integration value by
10 sample values which are obtained during said phase
integration interval, to obtain a reference phase
integration value;

storing said reference phase integration value;

initializing said phase integration value to zero
15 immediately prior to each of respective phase integration
intervals within said unit data sections of said data
wobble sequence and successively incrementing said phase
integration value by sample values which are derived
during said each phase integration interval, to thereby
20 obtain a phase integration value corresponding to said
each unit data section;

for each said unit data section, calculating an
absolute value of difference between said corresponding
phase integration value and said reference phase
25 integration value;

comparing said absolute difference value with a predetermined threshold value; and

judging a binary value expressed by said each unit data section, based upon results of said comparison.

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4. A wobble information detection apparatus for detecting wobble information on an optical recording medium having synchronizing information recorded at predetermined intervals along a track of said optical recording medium, said track being formed with a wobble which is phase modulated to record information in a plurality of sections including at least one reference wobble section which expresses a predetermined one of two different binary values and a plurality of successive unit data sections constituting a data wobble sequence, each of said unit data sections expressing one of said binary values, said apparatus including optical pick-up means for producing a wobble signal corresponding to said wobble during playback of said optical recording medium;

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20 wherein said apparatus comprises:

synchronizing signal generating means for operating on said wobble signal to generate a synchronizing signal that is synchronized with said wobble signal;

synchronous detection means for performing
synchronous detection of said wobble signal to thereby
obtain successive sample values of said wobble signal,
phase integration interval setting means for detecting
5 said synchronizing information, based on said sample
values, and for defining a series of phase integration
intervals occurring at respective timings that are
determined based on said synchronizing information;

means for initializing a phase integration value to
10 zero immediately prior to each of said phase integration
intervals;

memory means for storing a reference phase
integration value;

phase integration means functioning during a phase
15 integration interval within said reference wobble section
in said wobble signal to successively increment said
phase integration value by sample values which are
derived during said phase integration interval, to
thereby obtain said reference phase integration value and
20 supply said reference phase integration value to said
memory means to be stored therein, and functioning during
each of respective phase integration intervals within
said unit data sections of said data wobble sequence to
successively increment said phase integration value by
25 sample values which are derived during said phase

integration interval, for thereby obtaining a phase integration value corresponding to said each unit data section;

absolute difference value calculation means for
5 calculating, for each of said unit data sections, an absolute difference value between said reference phase integration value and said corresponding phase integration value;

comparator means for comparing each of said absolute
10 difference values with a predetermined threshold value;
and

judgement means for judging respective binary values expressed by said unit data sections, based upon results of said threshold value comparisons.